

CONCEPTS OF MODERN PHYSICS

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behavior of nuclei. Nevertheless, the nucleus turns out to be of paramount importance in the grand scheme of things. To begin with, the very existence of the various elements is due to the ability of nuclei to possess multiple electric charges. Furthermore, the energy involved in almost all natural processes can be traced to nuclear reactions and transformations. On a more parochial level, the liberation of nuclear energy in reactors and weapons has affected all our lives in one way or another.

11.1 DO NUCLEI CONTAIN ELECTRONS?

No

Nuclear forces are very strong

The electron structure of the atom was understood before even the composition of its nucleus was known. The reason is that the forces that hold the nucleus together are vastly stronger than the electric forces that hold the electrons to the nucleus, and it is correspondingly harder to break apart a nucleus to find out what is inside. Changes in the electron structure of an atom, such as those that occur when a photon is emitted or absorbed or when a chemical bond is formed or broken, involve energies of only a few electronvolts. Changes in nuclear structure, on the other hand, involve energies in the MeV range, a million times greater.

Let us begin our study of the nucleus with the most obvious question: Of what is it composed?

Mass spectrometer used to study the composition of meteorites.

